Notes on the Caviceps Group of the Genus *Epicauta* with Descriptions of First Instar Larvae[1]

(Coleoptera: Meloidae)

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Fifteen species of North American *Epicauta* have been placed in the Caviceps Group (Werner, 1955; Werner, Enns and Parker, 1966). Those included are *E. aspera* Werner, *E. wheeleri* Horn, *E. rehni* Maydell, *E. occipitalis* Werner, *E. singularis* Champion, *E. diversipubescens* Maydell, *E. cicatrix* Werner, *E. excavatifrons* Maydell, *E. straba* Horn, *E. afoveata* Werner, *E. impressifrons* Van Dyke, *E. caviceps* Horn, *E. rileyi* Horn, *E. insueta* Werner, and *E. stuarti* LeConte. Adults of this group are primarily active in autumn. Records for several species suggest that adults feed solely on the inflorescences of fall-blooming Compositae. Geographically, the group is almost totally confined to southwestern North America. Exceptions are *E. excavatifrons* from southeastern United States, and *E. insueta* from southern Mexico.

The purpose of this paper is to briefly review the adult and larval anatomy of the Caviceps Group and to alter its limits slightly by including two additional species. Also, the first instar larvae of three species are described and compared with those previously studied by MacSwain (1956). New food-plant records for adults are included.

ADULTS

The Caviceps Group has been defined primarily by adult anatomy (Werner, 1955). It has contained all North American species having males with the ventral and posterior surfaces of the meso- and metafemora, and the hind two pair of trochanters denuded, the two denuded femoral areas being separated by a fringe of long hairs. Long, tapering antennae is the only other important characteristic present in all members of the group. Several other traits which are absent in some of the species, however, do help delimit this taxon. These include various head and eye modifications, black spots on the abdomen and elytral base, a whorled setal pattern on the pronotum, and an elevation of the elytral suture near its basal third.

Based on both adult and larval anatomy *E. californica* Werner and *E. alphonsii* Horn, two cognate species from southern California, should, in

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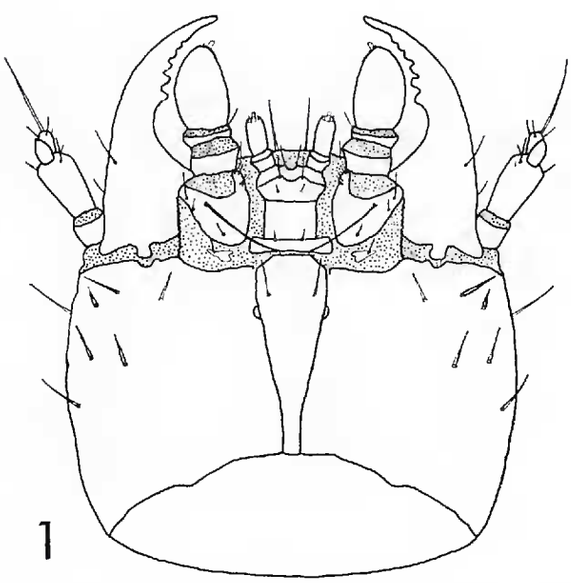
my opinion, be included in the Caviceps Group. Although mentioned as being similar to species of this group, reasons for their exclusion were not given by Werner (1955). These two species lack any indication of the head modifications which characterize several species of the Caviceps Group. However, their leg modifications are pronounced. The ventral surface of the meso- and metafemora in males of both species is not only denuded but also distinctly widened and flattened, and this surface is noticeably concave from base to apex. In addition, the ventral surface of the mesofemur is fringed with long hairs anteriorly as well as posteriorly. These differences merely represent specialized states of morphoclines already found in the Caviceps Group *sensu* Werner. Thus, in some species of the group (e.g. *E. caviceps* and *E. rileyi*) the ventral surface of the hind two pair of femora is simply denuded but in others it is also widened (e.g. *E. wheeleri*), and in *E. afoveata* slightly concave as well. The anterior fringe of long hairs on the mesofemur, although absent in most members of the group, does occur in *E. aspera.*

Associated with these leg modifications the metasternum of *E. californica* and *E. alphonsii* is denuded and distinctly concave rather than hirsute and convex as in most meloids. This trait also occurs to a lesser degree in *E. wheeleri*, *E. impressifrons*, and *E. afoveata.*

The leg and metasternal modifications of males of *E. alphonsii* and *E. californica* are correlated with a distinctive courtship behavior. This involves the male's stimulation of the female by the vigorous rubbing of his venter and hind two pair of legs over her elytra. Similar but less elaborate behavior has been observed in *E. wheeleri*, *E. impressifrons*, and *E. straba* (Pinto, in preparation).

Adults of *E. californica* and *E. alphonsii* are structurally similar to those of other species of the Caviceps Group although, excepting the characteristic leg and antennal structure, and a poorly developed elevation of the elytral suture, they lack all of the other specialized traits listed by Werner (1955). However, as in *E. straba*, two of these attributes (black spots and type of pronotal pubescence) do not apply to these two species since both are almost completely black and have only sparse pubescence on the pronotum. In any case, all traits other than leg and antennal structure vary greatly interspecifically within the group and most of these attributes are also absent in *E. aspera* and *E. rehni* (Werner, 1955).

The inclusion of *E. californica* and *E. alphonsii* in no way complicates the diagnosis of the Caviceps Group. The group now contains all species of North American *Epicauta* in which the meso- and metafemora and trochanters of the male are denuded ventrally, the denuded metafemoral



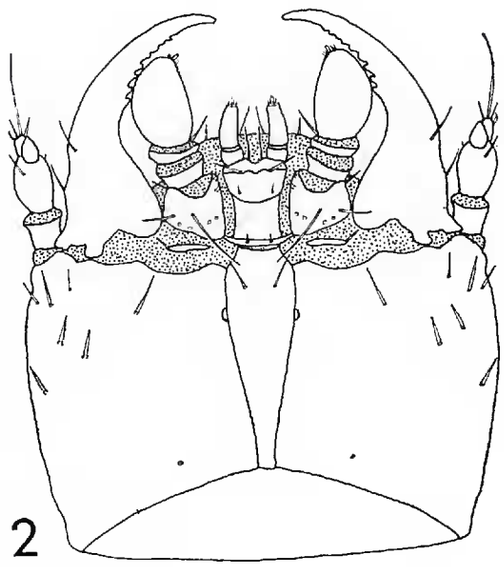


FIG. 1. Ventral view of head of first instar larvae of *Epicauta afoveata*. FIG. 2. Same, *E. alphonsii*. A similar illustration of the head of *E. californica* is given by MacSwain (1956).

area being fringed with long hairs posteriorly, and the mesofemoral area either fringed posteriorly only, or anteriorly as well.

First Instar Larvae

The first instar larvae of *E. californica*, *E. caviceps*, and *E. impressifrons* were described by MacSwain (1956). Those of *E. alphonsii*, *E. afoveata*, and *E. wheeleri* are described and compared with the former three species in Table 1. The terminology used in this section closely follows that of MacSwain (1956).

MacSwain followed Werner in placing *E. californica* in a group of its own, separate from *E. caviceps* and *E. impressifrons*. Yet he considered the three as separable from all other *Epicauta* by their uniformly dark coloration and by the strongly convex lateral margin of segment III of the maxillary palpi.

The original separation of *E. californica* from the two other members of the Caviceps Group was justified by several differences. The maxillary and labial palpi of *E. californica* are longer, the head capsule is abruptly constricted rather than evenly convergent behind, the sensory area of segment III of the maxillary palpi is more confined in area and more mesal in position, and the gular setae are much shorter. With the discovery of the three additional species, however, a continued division based on these attributes is no longer tenable. Thus, *E. alphonsii* agrees with *E. caviceps* and allies for some of these traits rather than with its

TABLE 1. Comparative anatomy of the first instar larvae of six species of the Caviceps Group[a]

Characters	Species					
	caviceps	*impressifrons*	*wheeleri*	*afoveata*	*alphonsii*	*californica*
Color	dark brown	dark brown	light yellow	dark brown except head, pro- & meso-thorax golden brown	dark brown	dark brown except pronotum light brown
Head Capsule						
a. Nature of posterior convergence of sides	even	even	abrupt	even	even	abrupt
b. Ratio of length to width	.88	.90	1.00	.95	.92	.86
c. Length of gular setae relative to length of seg. II of labial palpi	subequal	subequal	subequal	subequal	⅘ as long	½ as long
Mandible						
a. Number of teeth[b]	8	10	8–9	7	10–12	10
b. Length of apical seta relative to that of basal seta	slightly longer	subequal	slightly longer	slightly longer (Fig. 1)	subequal (Fig. 2)	slightly longer
Maxillary palpi						
a. Combined length of segs. I & II relative to that of III	⅓ as long	⅓ as long	⅓ as long	½ as long	½ as long	½ as long
b. Position of sensory area on seg. III	dorsal	dorsal	dorsal	dorsomesal	dorsomesal (Fig. 3)	dorsomesal

[a] Measurements represent means based on 10 specimens, except for *E. afoveata* where only three were available.
[b] Apical-most two or three may not be visible in outline when viewed from above or below.

TABLE 1. (Cont.)

Characters	Species					
	caviceps	*impressifrons*	*wheeleri*	*afoveata*	*alphonsii*	*californica*
c. Percent of length of seg. III covered by sensory area	65	60	65	60	70	45
d. Length of two-segmented sensory appendix relative to that of surrounding papillae	subequal	subequal (Fig. 5)	slightly longer	almost twice as long	slightly longer (Fig. 4)	slightly longer
Labial palpi						
a. Length of seg. I relative to that of II	½ as long	½ as long	½ as long	½ as long	⅓ as long	⅓ as long
Legs						
a. Number of lanceolate setae on femora	6	6	6	7	6	6
Abdomen						
a. Tergites bearing sclerous evaginations at base of marginal setae	I–V	I–V	I–VII	I–IV	I–VII	I–VII
b. Sternum of segment VII with two small sclerites (1), two small sclerites which may join medially (2), or a single median sclerite (3)	2	3	1	1	2	1
Body length (mm)	2.13	2.35	2.21	2.31	2.76	2.51
Length of caudal setae (mm)	.22	.28	.31	.32	.36	.23

closest relative, *E. californica*; and *E. wheeleri* and *E. afoveata* agree with *E. californica* and/or *E. alphonsii* for others (see Table 1).

As with adult anatomy then, larval characteristics indicate that the retention of *E. alphonsii* and *E. californica* apart from the Caviceps Group is an unnatural division. Although intragroup relationships remain obscure, I am tentatively considering *E. alphonsii* and *E. californica* closest to *E. afoveata* and *E. straba.*

Based on the six species treated here the larvae of the Caviceps Group can now be characterized as follows:

Head capsule (Figs. 1, 2) with lateral margins abruptly constricted or evenly convergent behind. *Antennae* with conical sensory organ attaining apex of segment III. *Mandibles* moderately slender with 7 to 12 teeth. *Maxillary palpi* with lateral margin of segment III markedly convex; sensory organ large, dorsomesal (Fig. 3) or almost completely dorsal in position. *Thorax* with line of dehiscence present full length of pro- and mesonotum, line entirely absent on metanotum. *Legs* with 6 or 7 lanceolate setae on femora. *Abdomen* uniformly colored; line of dehiscence absent; 10 setae present on marginal row of tergites I to VIII; sclerous evaginations absent at base of median transverse row of tergal setae, present at base of at least some marginal setae on segments I to V or VII; first abdominal spiracle slightly smaller than that of mesothorax, slightly larger than that of segment II; sternum of segments I to VI unsclerotized (occasionally 2 or 4 minute sclerites present on segments V and VI), that of VIII and IX fully sclerotized, that of VII partially sclerotized.

The uniformly colored abdomen, the posteriorly convergent sides of the head, the partially sclerotized sternum of segment VII, and the strongly convex lateral margin of segment III of the maxillary palpi serve to distinguish species of this group from all other known North American *Epicauta.* Based on these traits all six species will key to couplet 10 in MacSwain's (1956) "key to the species of *Epicauta.*" The only needed modification is the deletion of the first part of couplet 9, "abdomen yellow or yellow-brown." Five of the six species of the group have a dark brown abdomen but in *E. wheeleri* the body is uniformly yellow.

In comparing material with MacSwain's descriptions I disagree in

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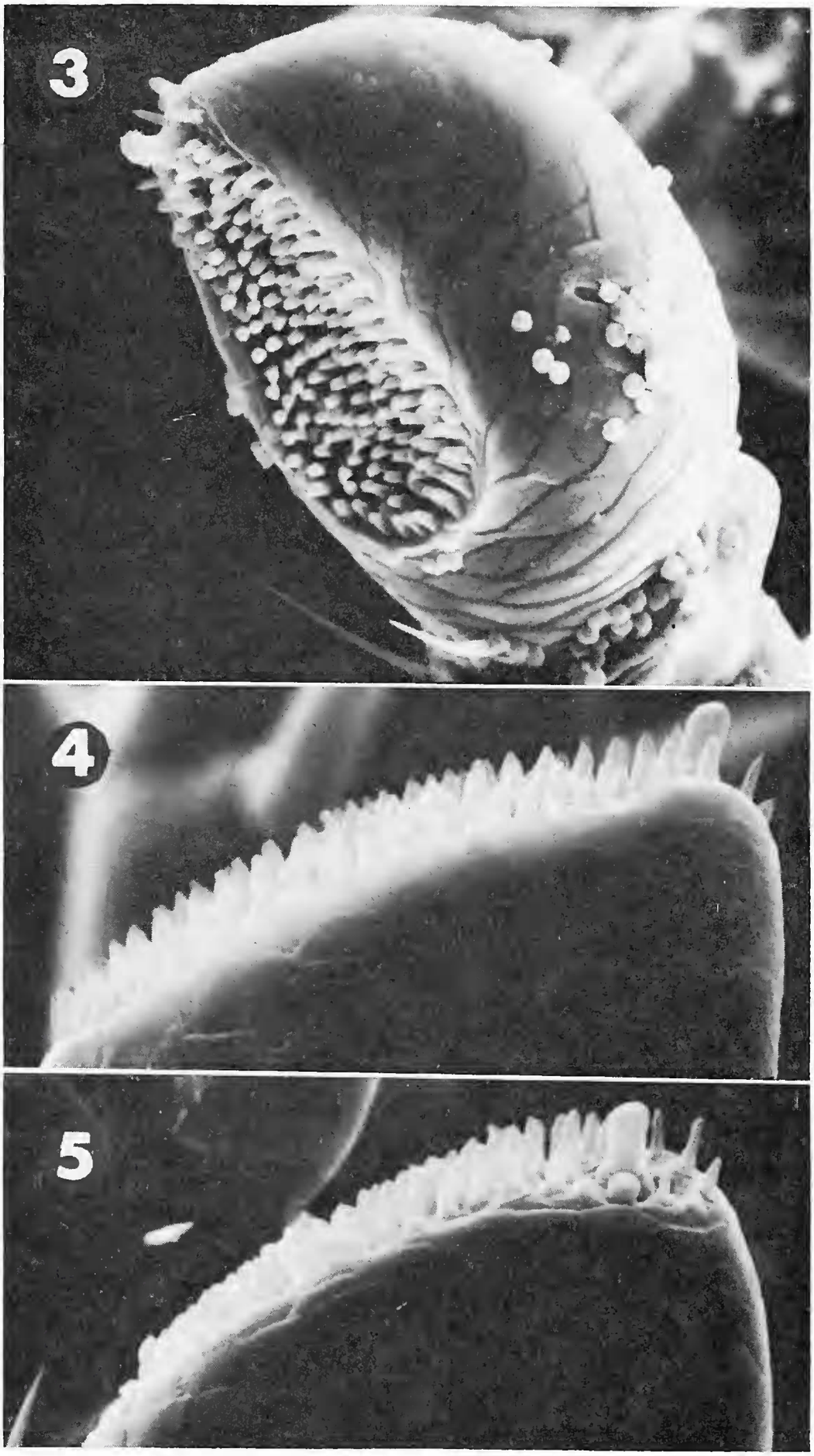
FIGS. 3–5. Scanning electron micrographs of the sensory area on segment III of the maxillary palpi of species of the Caviceps Group. FIG. 3. Dorsal view of right palpus of *Epicauta alphonsii* (800 ×). FIG. 4. Side view of right palpus of *E. alphonsii* showing relative length of two-segmented appendix and surrounding papillae (1000 ×). FIG. 5. Same, of left palpus of *E. impressifrons* (1000 ×). Micrographs made on a Jelco unit (JSMU-3).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only two instances. The terminal seta of the antenna in *E. impressifrons* is only slightly longer than segment II, not twice as long; and the two-segmented appendix on segment III of the maxillary palpi in *E. caviceps* and *E. impressifrons* is subequal to the surrounding papillae (Fig. 5) rather than twice as long.

MATERIAL EXAMINED.—MacSwain's (1956) material of *E. impressifrons*, *E. caviceps* and *E. californica* was available for this study. Additional material examined is as follows:

Epicauta impressifrons.—One specimen from a mass of eight eggs; adults, Whitewater Canyon, Riverside County, California, 16 October 1970, feeding on inflorescences of *Haplopappus acradineus* (Greene) Blake, and *Lepidospartum squamatum* (Gray) Gray.

Epicauta wheeleri.—Larvae from a mass of 35 eggs; adults, Whitewater Canyon, Riverside County, California, 16 October 1970, feeding on inflorescences of *Haplopappus acradineus* and *Lepidospartum squamatum.*

Epicauta afoveata.—Three larvae from a mass of 10 eggs; adults, 12 mi. SSW Borrego Springs, San Diego County, California, 15 November 1970, feeding on inflorescences of *Chrysothamnus paniculatus* (Gray) Hall.

Epicauta alphonsii.—Larvae from masses of 20 and 43 eggs, respectively; adults, 4 mi. NNW Lancaster, California, 20 October 1971, feeding on inflorescences of *Chrysothamnus nauseosus* (Pallas) Britton.

Epicauta californica.—Larvae from a mass of 45 eggs; adults, Menifee Valley, Riverside County, California, 5 November 1970, feeding on inflorescences of an unidentified Compositae.

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